In the Title:

Please amend the title as follows:

~~Systems, processes and integrated circuits for rate and/or diversity adaptation for packet communications~~ Arranging CELP Information Of One Frame In A Second Packet——

In the Specification:

Please enter the following new and replacement paragraphs:

[0001] The following coassigned ~~patent application(s) and~~ patents are hereby incorporated herein by reference:

[0002] ~~TI-28893P "Integrated Circuits, Systems, Apparatus, Packets and Processes Utilizing Path Diversity for Media Over Packet Applications," filed Jul. 9, 1999.~~ <u>US 6,496,477, issued Dec. 17, 2002.</u>

[0003] ~~TI-27834P "System for Dynamic Adaptation of Data/Channel Coding in Wireless Communications" by J. DeMartin, A. McCree, and K. Anandakumar, Ser. No. 60/086,217 filed May 21, 1998.~~ <u>US 6,421,527, issued Jul. 16, 2002.</u>

[0004] ~~TI-21753P "PC Circuits, Systems and Methods" by John L. So, Ser. No. 60/014,734 filed Apr. 2, 1996.~~ <u>US 5,987,590, issued Nov. 16, 1999.</u>

[0005] ~~TI-25535 "Devices, Methods, Systems and Software Products for Coordination of Computer Main Microprocessor and Second Microprocessor Coupled Thereto" by John L. So, Jeffrey L. Kerr, Steven R. Magee and Jun Tang, Ser. No. 08/833,267 filed Apr. 4, 1997.~~ <u>US 6,179,489, issued Jan. 30, 2001.</u>

[0005.1] <u>The following patents relate to this application: US 6,757,256, issued Jun. 29, 2004; US 6,804,244, issued Oct. 12, 2004; US 6, 678,267, issued Jan. 13, 2004; US 6,574,213, issued Jun. 3, 2003; US 6,765,904, issued Jul. 20, 2004; US 6,801,499, issued Oct. 5, 2004; and US 6,801,532, issued Oct. 5, 2004.</u>

[0104] 5. In an embodiment of incorporated coassigned patent ~~application TI-28893P~~ US 6,496,477, the original voice packet stream (P0 P1 P2) is sent in its entirety, on path 1 and on path 2.

[0296] In FIG. 15, a packet voice digital signal processor (DSP) is implemented as an integrated circuit ~~1411~~ 1511. The integrated circuit is suitably a CMOS DSP such as any suitable selection from the ~~TMS320C54.times.~~ TMS320C54x or ~~TSM320C6.times.~~ TMS320C6x DSP families, or other such families commercially available from Texas Instruments Incorporated, Dallas, Tex. USA. See Wireless and Telecommunications Products: Central Office, Telemetry RF Receivers and Personal Communications Solutions, Data Book, Texas Instruments Incorporated, 1996, which is hereby incorporated herein by reference, and particular Chapter 9, Digital Signal Processors therein.

[0297] For example, the ~~TMS320C54.times.~~ TMS320C54x fixed-point, DSP family is fabricated with a combination of an advanced modified Harvard architecture which has one program memory bus and three data memory buses. This processor also provides a central arithmetic logic unit which has a high degree of parallelism and application-specific hardware logic, on-chip memory, additional on-chip peripherals. This DSP provides a specialized instruction set for operational flexibility and speed of the DSP.

[0316] The ~~herein-incorporated paten application TI-28893~~ herein incorporated US 6,496,477 provides further disclosure about how path diversity packets are added. The emphasis of FIGS. 1,3, 15, 16, 17 and 18 are on the adaptive control

features of some process, integrated circuit and system embodiments whereby source rate and diversity are either individually or jointly initiated, increased, decreased and terminated. The said adaptations are performed according to a process embodiment in response to QoS-related data obtained from the network or from a destination monitoring process. The adaptively-determined sij and dij, or controls generated in a relationship to sij and dij in the manner of a function thereof or substantially correlated to them, are then used to start, stop and adjust the operations of the diversity software and hardware disclosed in ~~herein-incorporated TI-28893~~ US 6,496,477 and the other disclosure herein.

[0331] Cell phone base stations 1915, 1917 and 1911 are respectively coupled to IP packet network 351 via PSTN blocks 1971, 1973 and 1975 respectively. Each of the PSTN blocks 1971 and 1973 has a gateway therein to connect the call to the packet network 351. The gateways in PSTN blocks 1971 and 1973 suitably have adaptive rate/diversity embodiments included therein. Thus, rate/diversity adaptation modules suitably are sited in the gateways and base stations of the system of FIG. 19. For example, base stations 1911 and 1913 are directly connected to packet network 351 by their own adaptive rate/diversity packet interface software and software stacks, all as taught herein in the present patent application and the incorporated ~~TI-28893P~~ US 6,496,477.

[0333] Integrated circuits into which the adaptive rate/diversity improvements are suitably manufactured include DSP (digital signal processor) from Texas Instruments and other companies offering DSP integrated circuits. Other integrated circuits suitable for the adaptive rate/diversity improvements

include host microprocessor such as Intel's Pentium.RTM., Pentium II.RTM., Pentium III.RTM., Celeron.RTM., Xeon.RTM. and IA-64 microprocessors, AMD K6 and K7 microprocessors, National MediaGX and other microprocessors, and microcontrollers such as ARM and StrongARM series, MIPS series, Intel i960, Motorola Mcore and PowerPC integrated circuits, among many others. Still other integrated circuits which are contemplated for adaptive rate/diversity improvements include nonvolatile memories such as ROM, EPROM, EEPROM, Flash memory, EAROM, and FeRAM (Ferroelectric random access memory). Volatile memories such as DRAM, synchronous DRAM (SDRAM), R-DRAM (Rambus DRAM), DDR-DRAM, and other variants suitably also have a logic section or non-volatile section incorporating the adaptive rate/diversity improvements built into them as taught herein. In yet other embodiments, the adaptive rate/diversity improvements are loaded onto or manufactured into rigid disk drives, hard disk drives, and also various media such as floppy insertable disks, CD-ROM optical storage media, and/or chips in the read circuitry or other circuitry of drives for such storage media. Also, chipsets associated with processors suitably are in improvement embodiments made to have adaptive rate/diversity improvements manufactured into them, such as the Intel "440xx" series of chipsets, sometimes known as North Bridge and South Bridge chips, and the chipsets of other chipset manufacturers. (Chipsets of this type are also suitably improved with digital signal processors, as taught in any one or more of the coassigned ~~pending patent applications (TI-21753 and TI-25535)~~ patents US 5,987,590 and US 6,179,489 which are hereby incorporated by reference. The DSP suitably runs the adaptive rate/diversity improvements. In other versions, the adaptive software runs on the host microprocessor such as Pentium series or IA-64 series, or partitioned with part of the software on a

DSP coupled to the host microprocessor(s) in the computer system.

[0350] Broadcast with path diversity is described in connection with incorporated patent ~~application TI-28893P~~ US 6,496,477, FIG. 11. Conventional broadcast replicates the process of a single unicast connection from source to destination so that communication of a media stream is directed to many destinations. Improving upon conventional broadcast, adaptive rate/diversity processes as taught herein are replicated so that the media stream takes diverse packets to each of many destinations, and adaptive control of rate and time or path or combined time/path diversity as taught herein is applied to the communications each by each.

[0351] Multicast with path diversity is described in connection with incorporated patent ~~application TI-28893P~~ US 6,496,477, FIG. 12. Conventional multicasting fans out a media stream from a source farther out in the packet network so that communication of a media stream is directed to many destinations. Improving upon conventional multicast, adaptive rate/diversity process as taught herein is applied to the communications. The situation differs from adaptive rate/diversity control of improved broadcasting as described in the previous paragraph because rate/diversity adaptation of a given media stream at the source 1111 of ~~TI-28893~~ US 6,496,477 FIG. 12 affects plural destinations. When the plural destinations are experiencing different levels of QoS as reported in their RTCP packets sent back to source 1111, then the rate/diversity adaptation thus can be faced with conflicting QoS information to reconcile in making an adaptation transition such as 101 of FIG. 1.

[0354] Accordingly, several embodiments of adaptive rate/diversity control of improved multicasting are contemplated. As noted hereinabove, rate/diversity adaptation of a given media stream at the source 1111 of ~~TI-28893~~ US 6,496,477 FIG. 12 affects plural destinations. QoS reports come back to source 1111 from the various destinations for each portion in a series of portions comprising the transmission from source 1-111. The QoS reports from the various destinations for a given portion of the transmission are combined into one or more herein-defined "Multicast QoS" evaluation numbers in FIG. 24 step 2441 to drive the rate/diversity adaptation processes. Multicast QoS (MQoS) is variously defined for different process and device embodiments next. (The value of S, meaning estimated steady state overall transmission rate as in step 1631, is also chosen in a similar manner to compute what is herein called "Multicast S". In other words, use the information from each destination to compute an S value for that destination. Then, in a manner precisely analogous to any selected one of the MQoS calculations below, compute the Multicast S from the S values).

A. In a first method, the QoS reports from the various destinations for a given portion of the transmission are combined into a single herein-defined "Multicast QoS" evaluation number in step 2441 to drive the rate/diversity adaptation processes. In other words, Multicast QoS (MQoS) is defined for each corresponding transmission portion such as activity in a 5-second interval described by an RTCP report packet. The step 2431 of FIG. 24 simply uses the Loss Fraction datum in one RTCP report packet as a report datum (or computes criterion F from data like Loss Fraction and Delay Jitter in one RTCP report packet) or computes criterion F using QoS computation methods described with reference to FIGS. 1 and 23 for instance.

[0379] FIG. 25 illustrates software to implement each of steps 1621, 1623 and 1629 of FIG. 16. In FIG. 25, after a BEGIN, operations go to a step 2511 to determine whether a diversity flag is on. If not, then source rate sij is decreased in a step 2515. Next after step 2515, a step 2521 sets, or turns on, the diversity flag. Then a step 2531 calls a diversity routine to create diversity packets. Then a step 2541 updates packet header diversity fields and dependency information appropriately. Those features of the packet are described in ~~TI-28893~~ US 6,496,477 for path diversity. Then a RETURN 2571 is reached.

[0381] In FIG. 26, step 1631 of FIG. 16 commences and goes to an input step 2605. In step 2605, information specifying a steady state overall transmission rate S is either estimated locally or input from a network element. Next, operations go to a decision step 2611 to determine whether the diversity flag is on. If so, operations go to a decision step 2621 to determine whether the overall transmission rate sij+dij is equal to estimated steady state overall transmission rate S from step 2605, e.g., 11.2. If an estimated steady state overall transmission rate S value is not available, then a maximum amount (e.g., 16.0) is used for S by default. If so, then operations turn off (reset) the diversity flag in a step 2631. Next a step 2641 calls the diversity routine to reduce diversity. Then a step 2651 updates packet header diversity fields and dependency information appropriately. Those features of the packet are described in ~~TI-28893~~ US 6,496,477 for path diversity, and the path diversity routine is described in FIG. 18 therein. Then a RETURN 2681 is reached.

[0382] If in step 2621, the overall transmission rate is below value S, then operations branch to a step 2661 to change both

the source rate and diversity (and suitably the path diversity method of the Packet Transmission Table of ~~TI-28893~~ US 6,496,477 and other diversity methods) without closing down the diversity feature. Then operations go to step 2651 to update packet header as described above.

[0384] FIG. 27 shows how adaptive multipath routing is combined with adaptive rate/diversity to form a new combination process for integrated circuits, and systems of all kinds. In one embodiment, diverse paths via three particular proxies are identified as described in incorporated ~~TI-28893~~ US 6,496,477, FIGS. 18-25. A first path via the first proxy is maintained throughout a communications connection. A second path is established via the second proxy, but when packet loss becomes unacceptable the second path is reestablished via the third proxy. In another more complex embodiment of FIG. 27, the multipath routing process seeks a satisfactory path and may switch adaptively from one path to another. Concurrently, the multipath routing process has its source rate adaptively varied. Also concurrently, the multipath routing process has one or more additional adaptive multipath routing process "siblings" seeking a respective second satisfactory path for diversity packets and switching adaptively from one second path to another. Advantageously, a path diversity receiving process implemented in the destination operates as shown and described in connection with FIGS. 5, 17 and 26 of incorporated patent ~~application~~ ~~TI-28893~~ US 6,496,477 and/or as elsewhere described therein. In this way, complex and hard-to-solve network congestion problems are addressed by improved embodiments as illustrated by FIG. 27. FIG. 28 supplements the software blocks of FIG. 18 by adding ATM (asynchronous transfer mode), AAL (ATM Adaptation Layer) and

Frame Relay Software coupled to the IP block in a TCP/UDP/IP software stack.

[0386] FIG. 29 also illustrates the concept that not just two, but three or even more states per rate oval are suitably introduced. One state per oval has source rate only, with no diversity. Another state per oval has packets with a source rate and a diversity packet with its diversity rate. A third state per oval has packets with a source rate, plus two diversity packets with respective diversity rates. Various examples of a third state are shown in FIG. 6, diversity packets 621, 631 and 641. Furthermore, path diversity alternatives are illustrated in the incorporated patent ~~application~~ ~~TI-28893~~ US 6,496,477 such as in the Packet Transmission Table therein.

[0418] Again, other criteria for the transitions as described elsewhere herein are suitably employed. Each of the types of time diversity, path diversity, and time/path diversity as described herein and in the incorporated ~~TI-28893~~ US 6,496,477 are contemplated for use in various embodiments.